NISTTech

Apparatus & Method for Producing Metal Particles by Spray Pyrolysis using a Co-solvent

Efficient, safer method to produce nanoparticles of pure metal and metal oxide

Description

Metal nanoparticles are of interest for a variety of applications because of their unique chemical, electrical, and optical properties. This method provides for an efficient and effective way to generate nanoscale particles of metals via spray pyrolysis. The system is able to use metal salt precursors and simple co-solvents at low temperatures. The temperature and duration of heating of the system varies with the choice of metal salt precursor and/or co-solvent. Pure metal nanoparticles, or metal oxide nanoparticles may be created as desired. The use of an alcohol co-solvent decreases the heat requirement and amount of oxides in the powders.

Applications

- **Semiconductor, magnetic storage media and display manufacturing**
  Size standards for calibration of optical scattering instruments used by various industries to inspect materials for surface quality (surface defects)
- **Chemical manufacturing**
  Creates catalysts, conducting pastes, and templates

Advantages

- **Greater efficiency**
  Reduces temperature and time requirements
- **Less hazardous**
  Does not use hydrogen gas as a reducing agent
- **Controlled size distribution**
  Method produces pure metal nanoparticles having a size distribution that is within a predetermined range

Abstract

A spray pyrolysis method for producing pure metal and/or metal oxide particles uses a mixture of a carrier gas and a solution of a metal salt precursor, water and a co-solvent reducing agent. The metal salt precursors preferably comprise metals from the group consisting of Fe, Co, Ni, Cu, Zn, Pd, Ag and Au, whereas the salt anions preferably comprise nitrates, acetates, oxalates and chlorides. The co-solvents are those that act as a reducing agent, are vaporizable, are inert with respect to the carrier gas, and are hydrophilic, such as alcohols, in particular, low-carbon numbered alcohols such as methanol or ethanol.

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References

- Expired U.S. Patent # 6,679,938;Patent Expired Due to NonPayment of Maintenance Fees Under 37 CFR 1.362 02-20-2012
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Status of Availability

This technology is available in the public domain.

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